



IMPROVING URANIUM PROCESSING WITH MEMBRANE SYSTEMS

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ABSTRACT

Membrane filtration systems have regained focus in recent years as an effective means of liquid-liquid separation to increase the concentration of valuable elements, recover reagents or remove impurities. ORANO Mining (formerly AREVA) investigated this cost optimization process opportunity as early as 2011 for implementation at the Trekkopje project (Namibia). The key focus was to separate and recycle bicarbonate from the uranium bearing eluate solution. The performance targets were successfully achieved at lab- and pilot scale with an ultrafiltration and nano-filtration configuration system. Early 2015, ORANO Mining further launched an investigation into the use of membranes for acid recycling at the KATCO In Situ recovery mine in Kazakhstan based on the favorable results from the original bicarbonate application. KATCO is the world leader in ISR uranium mining with an eluate processing capacity of 80 000 m³/yr. This site consists of two processing plants namely, Muyumkum and Tortkuduk, located 40 kilometers apart, both operating under acidic conditions whereas precipitation and packaging are based in Tortkuduk only. This paper serves to present the results from the integration of a nano-filtration system at the Muyumkum satellite processing plant. The project consisted of screening laboratory bench studies conducted at ORANO-CIME followed by process validation at KATCO through further bench and pilot test work. The feasibility study assessments were successfully concluded which led to the implementation at an industrial scale in Muyumkum of a nano-filtration process to reduce eluate volumes being sent to the uranium precipitation section whilst achieving effective separation of uranium from sulfuric acid. Nano-filtration technology has drawn significant attention due to the efficiency and reproducibility of the process and its moderate capital cost relative to operational savings. The reliability of the previous results is a great opportunity to reduce operative expenditures within ORANO's next ISR mining project in Mongolia.

KEYWORDS

Membranes, Nano-filtration, Uranium concentration, Eluate, Acid recovery